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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/027,919 | 12/20/2001 | Masaru Seita | 51343 | 9973 |

21874 7590 07/01/2003

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| EXAMINER |
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WONG, EDNA

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| ART UNIT | PAPER NUMBER |
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1753

DATE MAILED: 07/01/2003

11

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/027,919

Applicant(s)

SEITA ET AL.

Examiner

Edna Wong

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 June 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3,5-8,10,11 and 13-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3,5-8,10,11 and 13-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

This is in response to the Amendment dated June 16, 2003. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Response to Arguments

Specification

The disclosure has been objected to because of minor informalities.

The objection to the disclosure has been withdrawn in view of Applicants' amendment.

Claim Objections

Claims **7 and 10** have been objected to because of minor informalities.

The objection of claims 7 and 10 has been withdrawn in view of Applicants' amendment.

Claim Rejections - 35 USC § 112

Claims **1-12** have been rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The rejection of claims 1-12 under 35 U.S.C. 112, second paragraph, has been withdrawn in view of Applicants' amendment.

Claim Rejections - 35 USC § 102

- I. Claim **9** has been rejected under 35 U.S.C. 102(b) as being anticipated by **Sonnenberg et al.** (US Patent No. 5,252,196).

The rejection of claim 9 under 35 U.S.C. 102(b) as being anticipated by Sonnenberg et al. has been withdrawn in view of Applicants' amendment.

- II. Claims **1-4** have been rejected under 35 U.S.C. 102(b) as being anticipated by **Kardos et al.** (US Patent No. 4,009,087).

The rejection of claims 1-4 under 35 U.S.C. 102(b) as being anticipated by Kardos et al. has been withdrawn in view of Applicants' amendment.

- III. Claims **6 and 7** are rejected under 35 U.S.C. 102(b) as being anticipated by **Kardos et al.** (US Patent No. 4,009,087).

The rejection of claims 6 and 7 under 35 U.S.C. 102(b) as being anticipated by Kardos et al. has been withdrawn in view of Applicants' amendment.

Claim Rejections - 35 USC § 103

- I. Claim **5** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Kardos et al.** (US Patent No. 4,009,087) as applied to claims 1-4 above.

The rejection of claim 5 under 35 U.S.C. 103(a) as being unpatentable over Kardos et al. as applied to claims 1-4 above has been withdrawn in view of Applicants'

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amendment.

II. Claim **8** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Kardos et al.** (US Patent No. 4,009,087) as applied to claims 6 and 7 above, and further in view of **Sonnenberg et al.** (US Patent No. 5,252,196).

The rejection of claim 8 under 35 U.S.C. 103(a) as being unpatentable over Kardos et al. as applied to claims 6 and 7 above, and further in view of Sonnenberg et al. has been withdrawn in view of Applicants' amendment.

III. Claims **10-12** have been rejected under 35 U.S.C. 102(b) as being anticipated by **Kardos et al.** (US Patent No. 4,009,087) in combination with **Sonnenberg et al.** (US Patent No. 5,252,196).

The rejection of claims 10-12 under 35 U.S.C. 102(b) as being anticipated by Kardos et al. in combination with Sonnenberg et al. has been withdrawn in view of Applicants' amendment.

Response to Amendment

Claim Objections

Claims **1, 10, 13-14, 16-17 and 19** are objected to because of the following informalities:

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Claim 1

line 2, it is suggested that the word -- a -- be inserted after the word "water,".

Claim 10

line 2, it is suggested that the word -- a -- be inserted after the word "water,".

line 9, the word "chosed" should be amended to the word -- chosen --.

Claim 13

line 3, the word "propionaldehyde" should be amended to the word -- propionaldehyde --.

line 3, the word "malanaldehyde" should be amended to the word -- malonaldehyde --.

Claim 14

line 2, the word "chosed" should be amended to the word -- chosen --.

Claim 16

line 2, the word "propionaldehyde" should be amended to the word -- propionaldehyde --.

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line 3, the word "malanaldehyde" should be amended to the word -- malonaldehyde --.

Claim 17

line 1, the word "chose" should be amended to the word -- chosen --.

Claim 19

line 2, the word "priopionaldehyde" should be amended to the word -- propionaldehyde --.

line 3, the word "malanaldehyde" should be amended to the word -- malonaldehyde --.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

Claims **1-3, 5-8, 10-11 and 13-19** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1

lines 9 and 12, the Markush group recites the word "and" two times. It is unclear

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what species are in the alternative, and thus, what the metes and bounds of the scope are.

Claim 2

line 16, the alternative expression of the Markush group is improper. MPEP 2173.05(h). The word -- consisting -- should be inserted after the word "group".

lines 18 and 20, the Markush group recites the word "and" three times. It is unclear what species are in the alternative, and thus, what the metes and bounds of the scope are.

Claim 10

lines 9 and 12, the Markush group recites the word "and" two times. It is unclear what species are in the alternative, and thus, what the metes and bounds of the scope are.

Claim 11

lines 18 and 20, the Markush group recites the word "and" two times. It is unclear what species are in the alternative, and thus, what the metes and bounds of the scope are.

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Claim 15

lines 1-2, it appears that "copper sulfate, copper cyanide or copper pyrophosphate" is further limiting the copper recited in claim 1, line 2. However, it is unclear if it is.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims **1-3, 5-8, 10-11, 13, 15-16 and 18-19** are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims **1-8, 11 and 13-43** of copending Application No. 09/970,271 (Cobley et al.). Although the conflicting claims are not identical, they are not patentably distinct from each other because claims 1-3, 5-8, 10-11, 13, 15-16 and 18-19 of the present invention fail to be patentably distinct from the inventions claimed in claims 1-8, 11 and 13-43 of the copending application because the independent claim of the present invention

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recites similar limitations, either alone or in combination with its dependent claims, as that of the claims of the copending application wherein the claims of the present invention are encompassed by the claim of the copending application. Therefore, the claims would have been an obvious variant over each other.

The claims of the present invention recite that the thiol-reactive compound is an aldehyde, ketone or carboxylic acid. The claims of the copending application recite an additive consumption inhibiting aldehyde. The aldehydes claimed in the present invention and the copending application encompass the same.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Plating Solution

I. Claims **1-3, 5, 13 and 15** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Eckles** (US Patent No. 4,384,930) in combination with **Okinaka et al.** (US Patent No. 4,469,564).

Eckles teaches an electrolytic copper plating solution comprising:

(a) copper (= copper sulfate) [col. 13, Example 15];

(b) water (= aqueous) [col. 3, lines 39-45];

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(c) a water-soluble chlorine compound (= chloride ions) [col. 18, claim 26]; and

(d) a thiol-reactive compound (= an aldehyde) [col. 5, lines 19-68].

The thiol-reactive compound is present in the electrolytic copper plating solution in an amount from 1.0×10^{-4} to 1.0×10^{-1} mol/liter (= up to about 25 g/l) [col. 5, lines 19-30].

The aliphatic aldehyde is formaldehyde or acetaldehyde (col. 5, lines 22-27).

The copper is copper sulfate (col. 13, Example 15).

Eckles does not teach wherein the electrolytic copper plating solution comprises a compound having the structure represented by the formula of -X-S-Y-; wherein -X-S-Y- is (3) $M-SO_3-(CH_2)_a-S-S-(CH_2)_b-SO_3-M$; and wherein the electrolytic copper plating solution contains 0.1 to 100 mg/l of the compound having the structure represented by the formula -X-S-Y-.

However, Okinaka teaches that sulfide additives are used to increase the ductility of the deposited copper (col. 6, lines 3-25).

Thus, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because one skilled in the art would have been motivated to have modified the electrolytic copper plating solution of Eckles with wherein the electrolytic copper plating solution comprises a compound having the

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structure represented by the formula of -X-S-Y- because this compound would have increase the ductility of the deposited copper as taught by Okinaka (col. 6, lines 3-25).

As to wherein -X-S-Y- is (3) $M-SO_3-(CH_2)_a-S-S-(CH_2)_b-SO_3-M$, Okinaka teaches an organic polysulfide of (4) $HSO_3-(CH_2)_3-S-S-(CH_2)_3-SO_3H$ (col. 6, lines 3-25).

As to wherein the electrolytic copper plating solution contains 0.1 to 100 mg/l of the compound having the structure represented by the formula -X-S-Y-, Okinaka teaches an organic polysulfide concentration between 0.0005 and 1 g/l (col. 6, lines 14-15).

II. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Eckles** (US Patent No. 4,384,930) in combination with **Okinaka et al.** (US Patent No. 4,469,564) as applied to claims 1-3, 5, 13 and 15 above, and further in view of **Uzoh et al.** (US Patent No. 6,355,153).

Eckles and Okinaka are as applied above and incorporated herein.

Eckles does not teach wherein the peroxo acids are chosen from performic acid, peracetic acid, peroxypropionic acid, peroxybutanoic acid and peroxypentanoic acid.

However, Uzoh teaches that inorganic and organic peroxides as metal oxidizing

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agents in an electrolytic copper plating solution (col. 9, lines 45-59).

Thus, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because one skilled in the art would have been motivated to have modified the electrolytic copper plating solution of Eckles with wherein the peroxo acids are chosen from performic acid, peracetic acid, peroxypropionic acid, peroxybutanoic acid and peroxy-pentanoic acid because inorganic and organic peroxides are conventionally added as metal oxidizing agents in electrolytic copper plating solutions as taught by Uzoh (col. 9, lines 45-59).

Process

III. Claims **6-8, 16 and 18** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Eckles** (US Patent No. 4,384,930) in combination with **Okinaka et al.** (US Patent No. 4,469,564).

Eckles teaches a process for electrolytic copper plating layer to a substrate comprising the step of:

contacting the substrate (= Hull cell panel) [col. 13, Example 15] with the electrolytic copper plating solution of claim 1 (see Roman Numeral I above).

Eckles does not teach applying an anodic current density of 0.1 to 10 A/dm²; wherein the substrate is a printed wiring board or a wafer; and wherein the substrate

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has a through hole or a via hole.

However, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because one skilled in the art would have been motivated to have modified the process of Eckles by applying an anodic current density of 0.1 to 10 A/dm² because the anodic current density is a result-effective variable and one skilled in the art has the skill to calculate the current density range that would determine the success of the desired reaction to occur, absent evidence to the contrary. MPEP § 2141.03 and § 2144.05(b).

Furthermore, Eckles teaches a current density of from below 0.3 A/dm² to above 12 A/dm² (col. 10, lines 60-63) and from between about 2.0 A/dm² to about 20 A/dm² (col. 13, lines 50-54).

As to wherein the substrate is a printed wiring board or a wafer; and wherein the substrate has a through hole or a via hole, it is conventional in the art to electroplate copper onto a printed wiring board or a wafer, wherein the board or wafer has a through hole or a via hole. The substrate does not appear to significantly change the process since the electrolytic copper plating solution would have electroplated such.

IV. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Eckles** (US Patent No. 4,384,930) in combination with **Okinaka et al.** (US Patent No.

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4,469,564) as applied to claims 6-8, 16 and 18 above, and further in view of **Uzoh et al.** (US Patent No. 6,355,153).

Eckles and Okinaka are as applied above and incorporated herein.

Eckles does not teach wherein the peroxo acids are chosen from performic acid, peracetic acid, peroxypropionic acid, peroxybutanoic acid and peroxypentanoic acid.

However, Uzoh teaches that inorganic and organic peroxides as metal oxidizing agents in an electrolytic copper plating solution (col. 9, lines 45-59).

Thus, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because one skilled in the art would have been motivated to have modified the electrolytic copper plating solution of Eckles with wherein the peroxo acids are chosen from performic acid, peracetic acid, peroxypropionic acid, peroxybutanoic acid and peroxypentanoic acid because inorganic and organic peroxides are conventionally added as metal oxidizing agents in electrolytic copper plating solutions as taught by Uzoh (col. 9, lines 45-59).

V. Claims **10-11 and 19** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Eckles** (US Patent No. 4,384,930) in combination with **Okinaka et al.** (US Patent No. 4,469,564).

Eckles teaches a method of controlling an electrolytic copper solution comprising

(i) copper (= copper sulfate) [col. 13, Example 15];

(ii) water (= aqueous) [col. 3, lines 39-45];

(iii) a water-soluble chlorine compound (= chloride ions) [col. 18, claim 26]; and

(iv) a thiol-reactive compound (= an aldehyde) [col. 5, lines 19-68],

comprising the step of:

adding the thiol-reactive compound to the electrolytic copper plating solution (col. 5, lines 19-68).

The aliphatic aldehyde is formaldehyde or acetaldehyde (col. 5, lines 22-27).

Eckles does not teach wherein the electrolytic copper plating solution comprises a compound having the structure represented by the formula of -X-S-Y-; wherein -X-S-Y- is (3) $M-SO_3-(CH_2)_a-S-S-(CH_2)_b-SO_3-M$; and maintaining a concentration of a compound having -X-S- structure equal or less than 1.0 micro mol/l.

However, Okinaka teaches that sulfide additives are used to increase the ductility of the deposited copper (col. 6, lines 3-25).

Thus, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because one skilled in the art would

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have been motivated to have modified the electrolytic copper plating solution of Eckles with wherein the electrolytic copper plating solution comprises a compound having the structure represented by the formula of $-X-S-Y-$ because this compound would have increase the ductility of the deposited copper as taught by Okinaka (col. 6, lines 3-25).

As to wherein $-X-S-Y-$ is (3) $M-SO_3-(CH_2)_a-S-S-(CH_2)_b-SO_3-M$, Okinaka teaches an organic polysulfide of (4) $HSO_3-(CH_2)_3-S-S-(CH_2)_3-SO_3H$ (col. 6, lines 3-25).

As to maintaining a concentration of a compound having $-X-S-$ structure equal or less than 1.0 micro mol/l, copper plates of enhanced quality were provided if a brightening agent is employed in a plating solution where the brightening agent has a structure of the active species $(HS-R-SO_3)$ and the dimer $(O_3S-R-S-S-R-SO_3)$.

Thus, the concentration of a compound having $-X-S-$ structure is a result-effective variable and one skilled in the art has the skill to calculate the concentration that would determine the success of the desired reaction to occur, e.g., brightening, absent evidence to the contrary. MPEP § 2141.03 and § 2144.05(b).

Citations

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

GB 2,264,717 is cited to teach an aqueous cyanide-free copper plating bath

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comprising an aldehyde.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

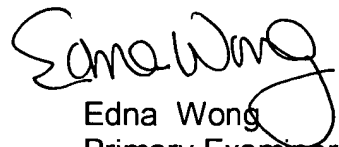
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Edna Wong whose telephone number is (703) 308-3818. The examiner can normally be reached on Mon-Fri 7:30 am to 5:00 pm, alt. Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (703) 308-3322. The fax phone numbers

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for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 873-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-1495.


Edna Wong
Primary Examiner
Art Unit 1753

EW
June 29, 2003